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AUTHOR Yoon, Bokhee; And Others
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ABSTRACT

The validity of teachers' reports of students' instructional experiences (content exposure or coverage) and content validity of a given course were studied by examining the consistency of reported content coverage for teachers across two consecutive years (1988 and 1989). In addition, the sensitivity of the test to instruction was examined by linking student performance patterns to instructional experiences of students as corroborating evidence of their relationship. Analyses were based on teacher and student data from approximately 300 sections of high school mathematics classes (approximately 2,000 examinees) in California using results from the Algebra Readiness and Elementary Algebra examinations of the Mathematics Diagnostic Testing Program. Twenty teachers responded to a questionnaire about their coverage of the mathematics topics in both years. Overall, results indicate that the prevalence and type of coverage of topics were consistent with their curricular sequence across years. Patterns were consistent with logical expectations for the topic within a given course across years and across teachers. Cross-validation of teachers' responses on content coverage in a specific topic category (for a specific course) was successful. Insight into instructional practices was provided by questionnaire responses. Three illustrative figures and three appendices providing content coverage figures in nine tables are provided. A 31-item list of references is included. (SLD)

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Assessing the Content Validity of Teachers' Reports of Content Coverage and Its Relationship to Student Achievement

CSE Report No. 328

Bokhee Yoon
Leigh Burstein
Karen Gold

Center for Research on Evaluation, Standards, and Student Testing
University of California, Los Angeles

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Many conceptual and analytical studies have been conducted to improve the validity of subject matter tests and the instructional sensitivity of psychometric and statistical methods used to analyze, interpret, and report test data in large-scale achievement testing (Burstein, 1990a, 1990b; Burstein, Aschbacher, Chen, Li, & Qi, 1986; Cole, 1988; Gold, 1990; Harnish, 1983; Linn, 1983; Muthén, 1989; Muthén, Kao, & Burstein, 1988; Porter, 1989; Schmidt, 1983). Generally, there are multiple, systematic factors that contribute to student performance as measured by an instructional assessment at a given point in time. The factors such as student ability, topic exposure, and methods of instructional exposure that affect performance have to be considered in designing, analyzing and reporting tests (Burstein, 1990b; Burstein et al.,1986; Leinhardt, 1983; Leinhardt & Seewald, 1981; Muthén et al., 1988; Yoon, Burstein, Gold, Chen, & Kim, 1990).

As achievement tests have become influential in policy decisions, the degree of overlap between the content tested and the content taught has increased in importance (Airasian & Madaus, 1983; Leinhardt & Seewald, 1981). Students' exposure to different subject matter and the way in which subject matter has been covered will affect students' performance on tests. Therefore, how well achievement test items reflect student knowledge and the content of instruction are clearly of interest (Harnish & Linn, 1981). Content coverage is considered especially important in state-by-state comparisons with increased concern about fairness of the comparisons due to differential learning opportunities across states or districts (Linn, 1983).

The purposes of the present study are (a) to investigate the validity of teachers' reports of students' instructional experiences (content exposure or coverage) and content validity of a given course by examining the consistency of

reported content coverage for teachers across two consecutive years (1988 & 1989), and (b) to examine the sensitivity of the test to instruction by linking student performance patterns to instructional experiences of students as possible corroborating evidence of their relationship. The results of earlier attempts validating teachers' reports of content coverage were reported earlier (Yoon, et al., 1990). This study refined the procedures from the earlier work by looking at each teacher's report of content coverage and relating it to his/her students' performance on each item.

Data

The data used in this study came from the Mathematics Diagnostic Testing Program (MDTP). Under this project, the University of California and California State University systems have developed a series of four diagnostic tests (Algebra Readiness, Elementary Algebra, Intermediate Algebra, and Pre-calculus) to be used voluntarily in middle and secondary schools in California in an effort to improve secondary school mathematics. MDTP also offers teachers the opportunity to obtain student-level diagnostic performance data through the administration of one of a variety of examinations.

In this study, analyses are based on teacher and student data from approximately 300 sections (176 sections, 3 districts, 8 schools in 1988, and 112 sections, 3 districts, 10 schools in 1989) of mathematics spanning courses in Pre-algebra, Math A, Math B (special to California schools as an alternative route to Algebra I), Algebra I, and Geometry. The analyses in this study are based on data from the Algebra Readiness and the Elementary Algebra examinations administered during the 1988 and 1989 school years. Each of these tests consists of 50 multiple-choice items administered during a 50-minute class period. There

are approximately 2000 examinees and 20 teachers for both tests considered per year after matching by teacher and course for 1988 and 1989.

Instrumentation

In addition to the achievement data in the study, classroom teachers responded to a questionnaire about their coverage of mathematics topics presented in each of the classrooms that were administered the diagnostic test. The response options for each mathematics topic on the questionnaire were examined, and patterns of teachers' responses on content coverage were evaluated and classified.

In our instrumentation, teachers were presented with different math topics and were asked to indicate how these topics are covered in each mathematics course they teach, using the following set of response options:

1. NEW – Taught as new content
2. EXTENDED – Reviewed and extended
3. REVIEW – Reviewed only
4. ASSUMED – Assumed as prerequisite knowledge and neither taught nor reviewed
5. TAUGHT LATER – Taught later in the school curriculum
6. NOT IN CURRICULUM – Not in the school curriculum
7. DON'T KNOW - Not taught now and don't know if in school curriculum

The seven response alternatives are adapted from Opportunity to Learn questions and topic-specific teacher questionnaires used in the Second

International Mathematics Study.[1] The questionnaire included topics which were identified as included in any of the four tests developed by MDTP or in the secondary school mathematics grid developed as part of an earlier study of the content validity of MDTP tests (Burstein et al., 1986). Thus the questionnaire was expected to span the course material for college-preparatory secondary school mathematics, necessitating an extensive list of topics (97 topics classified into 12 distinct subgroups): integers (4 topics); fractions, decimal, ratio, proportion, and percent (14); exponents, radicals, rational expression and square roots (14); polynomials (12); algebraic equations (11); inequalities (3); rational expressions (4); probability and statistics (2); geometry (15); absolute value (2); functions (10); and trigonometry (6).

If there was more than 80 percent consensus among teachers or each teacher across periods in a specific topic category (for a specific course), the topic was assigned one of the following categories: CORE (New + Extended), PRIOR (Reviewed + Assumed), NOT TAUGHT (Taught later + Not in curriculum + Don't know). These auxiliary data were used to validate the substantive interpretation of the multidimensional structure of the test and the effect of differential learning on student performance indicated by the current analyses of the achievement data.

Methods and Techniques

The study relates patterns of teachers' content coverage responses with students' performance on the diagnostic math achievement tests. The first set of analyses with the teacher data investigated how consistently and how differently

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[1]These data are from a national sample of United States eighth-grade students' mathematics achievement tests conducted by IEA (International Association for the Evaluation of Educational Achievement) in 1981-1982.

course topics have been covered across years and within the same year by each teacher. Teachers' content coverage for a specific course was analyzed by extending previous research (Yoon et al., 1990) to look at content coverage by:

1. the same teacher teaching the same course across years in 1988 and 1989 (results shown in Figure 1 and Tables A-1 and A-2 in Appendix A);
2. the same teacher teaching a different course in 1988 (Figure 2 and Table B-1 in Appendix B); or
3. the same teacher teaching a different course in 1989 (Figure 2 and Table B-2 in Appendix B).

The same teacher teaching a different course in different years (i.e., teaching Algebra I in 1988 and Geometry in 1989) also was analyzed, but since the results were similar to results for patterns 2 and 3 above, those results will not be presented here. Figure 1 shows the plot of topics with content coverage by courses for the same course and the same teacher for two consecutive years. The notations for the courses are: L (Lower than Pre-algebra), M (Math A), P (Pre-algebra), A (Algebra I) and G (Geometry). Figure 2 shows the plot of topics with content coverage by courses for the same teacher teaching different courses across two years. The notation for the courses are: PG (a teacher taught both Pre-algebra and Geometry in the same year), MA (Math A and Algebra I), LM (Lower than Pre-algebra and Math A), MG (Math A and Geometry), and AG (Algebra I and Geometry).

Evidence that reported content coverage patterns are similar across years may suggest that the chosen means of collecting such data has functioned as expected under the "steady state" curricular conditions prevalent in participating schools. A representative sample of the results is shown in Tables A-1 to B-2 in Appendices A and B. The notations for these tables are as follows:

1. CC: Taught as CORE across years
2. PP: Taught as PRIOR across years
3. NN: NOT TAUGHT across years
4. CP: Taught as CORE in 1988 and as PRIOR in 1989
5. CN: Taught as CORE in 1988 and NOT TAUGHT in 1989
6. PC: Taught as PRIOR in 1988 and as CORE in 1989
7. PN: Taught as PRIOR in 1988 and NOT TAUGHT in 1989
8. NC: NOT TAUGHT in 1988 and taught as CORE in 1989
9. NP: NOT TAUGHT in 1988 and taught as PRIOR in 1989

The second set of analyses relates the teacher topic coverage response data to student performance at the item level. The differences in year 1 (1988) and year 2 (1989) p-values at the item level were calculated, and these differences were compared to differences in teachers' reported coverage of topics across the two years. These analyses show how consistently each teacher covered a course topic across years and, if not consistent, whether the lack of consistency systematically affects students' performance on MDTP test items measuring a given topic. Performance on test items in a given topic area should be consistent with teachers' report of coverage of these topics. The MDTP Algebra Readiness and Elementary Algebra tests, the two tests administered to students in the course types, were considered here. Students enrolled in Lower than Pre-algebra, Math A, Math B, or Pre-algebra took the MDTP Algebra Readiness test, and students enrolled in Algebra I or Geometry took the Elementary Algebra test. The results of pooled p-values across classes and teachers using the Algebra Readiness Test and Elementary Algebra Test are shown in Figure 3, and the results for individual teachers teaching the same course across years are shown Tables C-1 to C-5 in Appendix C.

Results

Topic Coverage Patterns

The results in Figures 1 and 2 provide evidence on the validity of teachers' responses on content coverage for a given course. The results of teacher content coverage by the same teacher teaching the same course across years (i.e., the same course taught by the same teacher in 1988 and 1989) are summarized in Figure 1, which shows the plot of topics with content coverage by courses. (More detailed results, including item content, are presented in Tables A-1 and A-2 in Appendix A.)

The results in Figure 1 show that 71 percent of topics were claimed to have been covered consistently in different levels of courses across two years. In the category CC (taught as CORE both in 1988 and 1989), 30 percent of topics were covered as CORE consistently across courses in both years, which implies that topics were mostly covered as new topics or reviewed and extended across courses. The number of topics taught as CORE in each course increased as the course level went up; about 20 topics were taught as CORE in Lower than Pre-algebra while about 36 topics in Pre-algebra and about 40 topics in Algebra I were taught as CORE for two consecutive years. However, the number of topics taught as CORE in Geometry is relatively small (about 12 topics), which is reasonable because most topics taught as CORE in lower level courses were covered as PRIOR in Geometry. As shown in the category PP, about 33 topics were covered in Geometry as PRIOR while less than 10 topics were covered in Algebra I as PRIOR. Only a few topics were covered as PRIOR in Lower than Pre-algebra and Pre-algebra courses, as expected. In the category of NN about 66 topics were not taught in Lower than Pre-algebra, and the number of topics covered as NOT

TAUGHT went down considerably in Algebra I and Geometry. The deviations in consistency in the categories of CP, CN, PC, PN, NC and NP may be due to changes in school or district curriculum policies or differences in class composition across years. These variations may also depend on the specificity and clarity of topic descriptions as well as on individual differences among teachers in their use of the response scale.

In Algebra I, with the exception of teacher T15 (detailed results are shown in Table A-2 in Appendix A), teachers covered topics for each course consistently across years. Topic coverage in Algebra I concentrates on the traditional core of introductory algebra (exponents, polynomials, algebraic equations, inequalities, rational expressions, absolute value). In Geometry, many more topics were covered as PRIOR compared to Algebra I, and the number of topics covered as CORE across years decreased considerably from Algebra I to Geometry as shown in Figure 1. Topics such as "Pythagorean Theorem," "perimeter and area of triangles," and "volume of cubes, cylinders," were covered as CORE; otherwise, topics covered as CORE in Algebra I were covered as PRIOR in Geometry. The idiosyncrasy of plots in the categories of CP, CN, PN and PC in Algebra I and Geometry occurs because teacher T15 taught an "advanced" class in 1988 and a "typical" class in 1989. This implies that students' instructional experiences may be affected by class types.

Figure 2 shows the results of teachers' responses on content coverage across courses for two consecutive years. The results reported in Tables B-1 and B-2 in Appendix B show content coverages of 97 topics by the same teacher who taught different courses in 1988 or in 1989. These results show how the same topics were covered in low (i.e., lower than Pre-algebra) and high (i.e., Algebra I) levels of classes and how consistently a teacher covered topics in different courses

across years. About 22 percent of topics were covered as CORE across courses such as Math A and Algebra I, Lower than Pre-algebra and Pre-algebra, and Algebra I and Geometry. About 31 percent of topics were NOT TAUGHT across courses, which was the same percentage as in Figure 1. These results support the results of consistent content coverage across years in Figure 1. As expected, the categories of CP and NC showed a reasonable transition in content coverage across courses.

In the category of CP, there was a big transition in content coverage from Algebra I to Geometry. About 60 topics were covered consistently as CORE in Algebra I and as PRIOR in Geometry by the same teacher across years. In this category all the lower level courses were compared with higher courses which showed a logical expectation of content coverage across courses. Similarly, the category of NC shows that 19 percent of topics across courses were covered as NC, and lower level courses compared with higher level courses.

The categories of CN, PC and PN clearly provide other evidence of validity of teachers' responses on content coverage by showing almost zero percent of topic coverage in these categories across lower level and higher level courses. There was almost no topic covered as PRIOR in Math A and as CORE in Algebra I, or as PRIOR in Pre-algebra and as CORE in Geometry. These results strongly support the validity of teachers' responses on content coverage in a given course. Topics taught differently across courses are "finding sum of interior angles," "isosceles and equilateral triangles," and "congruent triangles," taught as CORE in Pre-algebra, as PRIOR in Algebra I, but NOT TAUGHT in Lower than Pre-algebra.

Overall, the results above showed that the prevalence and type of coverage of topics were consistent with their curricular sequence across years. Patterns

were consistent with logical expectations for the topic within a given course across years and across teachers; therefore, cross-validation of teachers' responses on content coverage in a specific topic category (for a specific course) was successful.

Relationships with Performance

The p-value differences between 1988 and 1989 at the item level for classes taught by the same teacher in successive years and the relationship of these differences to differences in teachers' reported coverage of topics are reported in Figure 3 and Tables C-1 to C-5 in Appendix C. These results show the evidence of content validity of test items by analyzing what was taught at secondary school mathematics and what was tested. Furthermore, content coverage of test item topics was related to students' performance on the Algebra Readiness Test and Elementary Algebra Test.

Content coverage reports of test item topics in Tables C-1 to C-5 validated the content validity of test items in Algebra Readiness Test and Elementary Algebra Test by showing a consistent content coverage on the test item topics; topics which were claimed to be taught were most likely tested in both tests, and this validates the content validity of test items.

P-value difference distributions of students' performance on the Algebra Readiness Test and Elementary Algebra Test are shown in Figure 3. When topics were taught consistently across years as in the category of CC, p-values do not seem to vary across years. However, there were some deviations in p-values when topics were taught differently across years. For example, there was a p-value mean difference of .04 when topics were covered as CORE and as PRIOR,

and a .05 difference when topics were NOT TAUGHT in 1988 and covered as CORE in 1989.

However, these results are not convincing since these p-value differences are the average p-value differences across topics. When p-value differences were considered for each topic, some topics were relatively more sensitive to content coverage than others. For example, the topics "exponents with integral exponent," "order and comparison of fractions," and "perimeter and area of triangles and squares" showed relatively large p-value differences greater than .20. These topics were taught as CORE in 1988 and as PRIOR in 1989. In Math A, the topics "simplification of a rational expression" and "multiplication and division of fractions" showed relatively large p-value differences greater than .13. These topics were covered as CORE in 1988 and as PRIOR in 1989. These topics are sensitive to content coverage and to an effect of different content coverage on students' performance. In Pre-algebra, the topic "location of points in coordinate plane" showed a p-value difference of .15, and it was NOT TAUGHT in 1988 and taught as CORE in 1989. This topic was sensitive to content coverage, which clearly shows that exposure to a topic influences students' performance. The topics "basic operations with signed number" and "addition and subtraction of decimals" showed p-value differences but were not sensitive to content coverage, which implies that relatively easy topics do not seem to be influenced as much as fairly hard topics. In Algebra I, the topic "Pythagorean Theorem and special triangle" also seems to be sensitive to content coverage, showing a p-value difference of .12; it was NOT TAUGHT in 1988 and taught as CORE in 1989. The topics "algebra operation of literal symbol," "circumference and area of circle," "addition and subtraction of square roots" and "solving quadratic equation by factoring" also provided evidence of the effect of content coverage by showing very

low p-values and small p-value differences less than .05; these topics were NOT TAUGHT across years. These results are shown in Tables C1 to C5.

Implication

We considered the validity of teachers' responses on students' instructional experiences (content coverage) and viewed student test performance as supporting evidence. The patterns of responses were potentially realistic portrayals of coverage for different courses and topics at certain levels of specificity. This study provided an insight into the functioning of teachers' questionnaire responses about content coverage by examining and monitoring instructional practices.

Since the effect of content coverage is sensitive to the level of item difficulty, analyzing p-value differences as a function of the level of item difficulty, teachers' characteristics and content coverage might be interesting. Because teachers responded to the questionnaire without looking at the test items in this study, taking consideration of item difficulty in an analysis would also be worthwhile.

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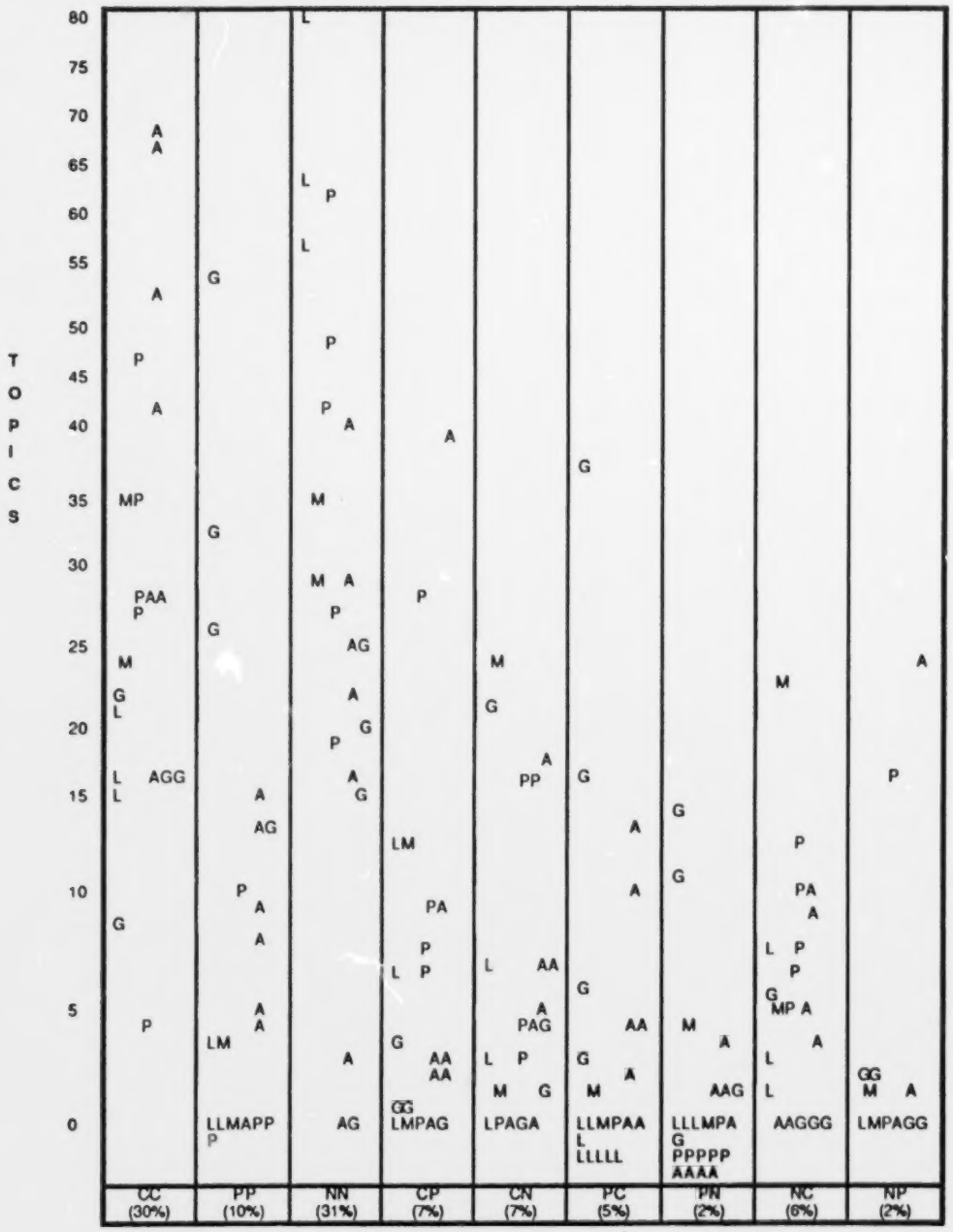
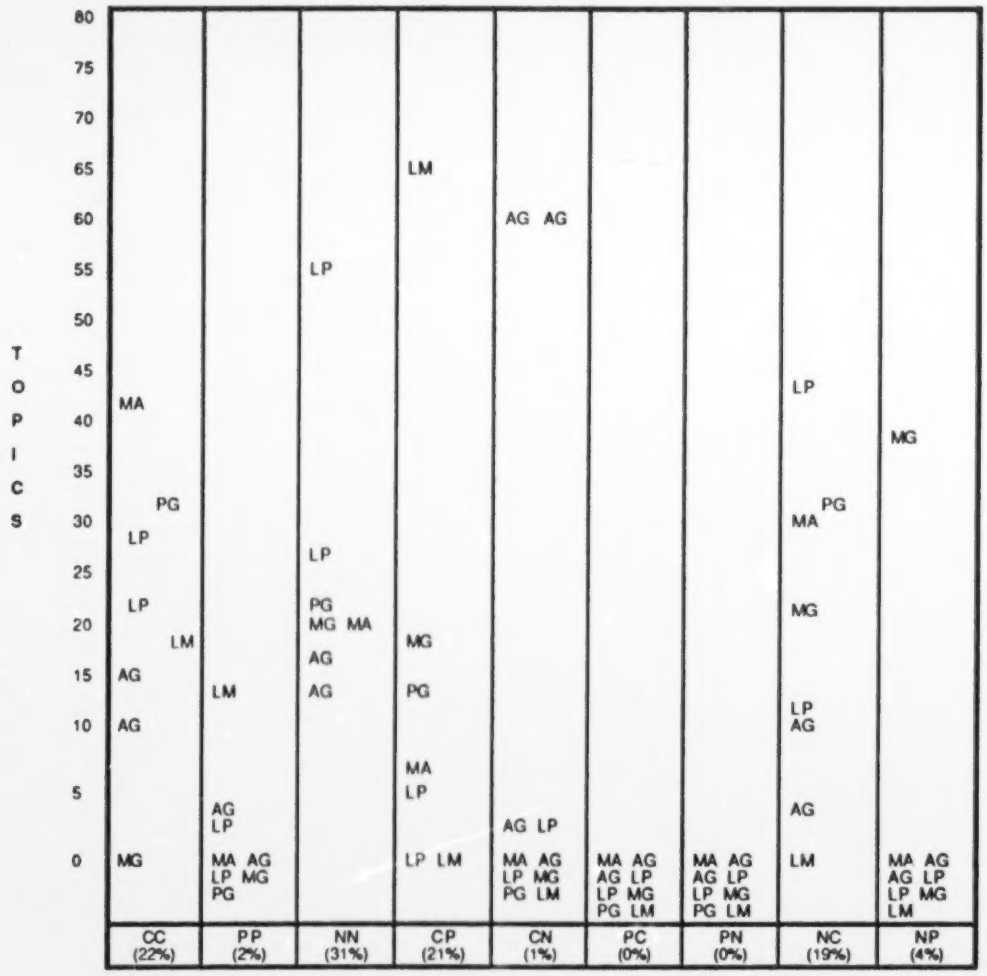
Figure 1. Plot of Topics with Content Coverage by Courses (Teachers' responses of content coverage for the same course for two consecutive years)



Content Coverage

L: Lower than Pre-algebra
M: Math A
P: Pre-algebra
A: Algebra I
G: Geometry

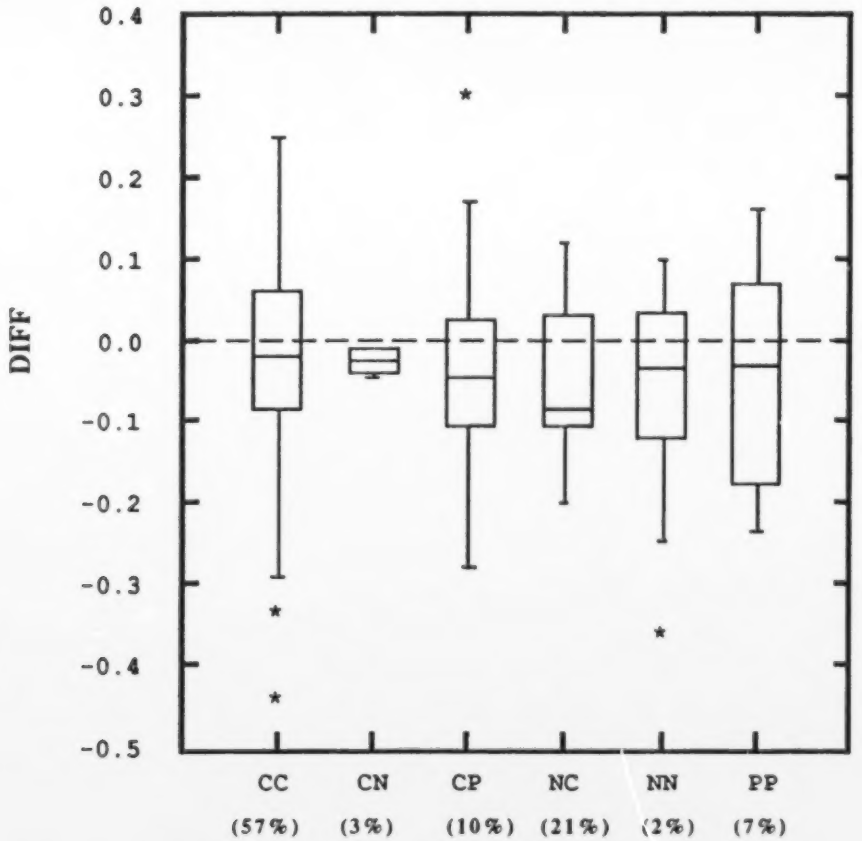
Figure 2. Plot of Topics with Content Coverage by Courses (Teachers' responses of content coverage for the different courses for two consecutive years)



Content Coverage

MA: Math A in 1988 and Algebra I in 1989
PG: Pre-algebra in 1988 and Geometry in 1989
AG: Algebra I in 1988 and Geometry in 1989
LP: Lower than Pre-algebra in 1988 and Pre-algebra in 1989
MG: Math A in 1988 and Geometry in 1989
LM: Lower than Pre-algebra in 1988 and Math A in 1989

Figure 3. P-value Difference Distributions of Students' Performance on Algebra ReadinessTest and Elementary Algebra Test



Means		CC (57%)	CN (3%)	CP (10%)	NC (21%)	NN (2%)	PP (7%)
	1988	.43	.30	.30	.28	.29	.36
	1989	.44	.32	.34	.33	.35	.40

CONTENT

Appendix A

TABLE A-1 1988/1989 TEACHER CONTENT COVERAGE BY SAME TEACHER SAME COURSES ACROSS YEARS
(Algebra Readiness Test)

ITEMS	COURSE: / TEACHER:	LOWER THAN PRE-ALGEBRA			MATH A		PRE-ALGEBRA				
		T16	T17	T18	T1	T3	T5	T8	T12	T14	T20
1	'BASIC OPERATIONS WITH SIGNED NO. '	CC	CC	NN	CP	CC	CP	CC	CC	CC	CP
2	'PRIME FACTORIZATION '	CC	CC	NN	CC	CC	CC	CC	CC	CC	CP
3	'FINDING DISTANCES ON NUMBER LINE '	CC	CC	NN	CC	CC	CC	CC	CP	NC	CP
4	'USING DEFINITION OF DIVISIBILITY' '	CC	CC	NN	CC	CC	CP	CC	CP	CC	CP
5	'ADD. & SUB. OF FRACTIONS '	CP	CP	CC	CP	CC	CP	CP	CP	CC	PP
6	'MUL. & DIV. OF FRACTIONS '	CP	CP	CC	CP	CC	CP	CP	CP	CC	PP
7	'ORDER & COMPARISON OF FRACTIONS '	CP	CP	CC	CP	CC	CC	CP	CP	CC	PP
8	'SIMPLIF. OF COMPLEX FRACTIONS '	CP	CP	CC	CP	CC	CC	CP	CP	CC	CP
9	'ADD. & SUB OF DECIMALS '	CP	CP	CC	CP	CC	CP	CP	CP	CC	PP
10	'MUL. & DIV. OF DECIMALS '	CP	CP	CC	CP	CC	CP	CP	CC	CC	PP
11	'ESTIMATION & APPROXIMATION '	CC	CC	CC	CP	NP	CC	CC	CC	CC	PP
12	'CONV. BET. FRACTIONS & DECIMALS '	CC	CP	CC	CP	CC	CC	CC	CC	CC	PP
13	'CONV. BET. FRACTIONS & PERCENT '	CC	CP	CC	CP	CC	CC	CC	CC	CC	PP
14	'COMPUT. WITH DECI & FRAC, ROUND. '	CC	CC	CC	CP	CC	CC	CC	CC	CC	PP
15	'COMPUTATION OF PERCENT '	CC	CP	CC	CP	CC	CC	CC	CC	CC	PP
16	'CONCEPT OF PROPORTION '	CC	PP	CC	CC	PP	CC	CC	CC	CC	CC
17	'COMPUTATION OF PROPORTIONS '	CC	PP	CC	CC	PP	CC	CC	CC	CC	CP
18	'APPLIC. OF RATIO OR PROPORTIONS	CC	PP	CC	CC	PP	CC	CC	CC	CC	CP
19	'APPLIC. LAWS OF EXPONENTS '	CC	CP	NN	CC	CC	CC	NN	CC	NC	CP
20	'POWERS OF 10 & SCIENTIFIC NOTAT. '	CC	CP	NN	CC	PC	CC	NN	CC	CC	CP
21	'EXPONENT. WITH INTEGRAL EXPONEN. '	CC	CP	NN	CC	NC	CC	NC	CN	NC	CP
22	'SQ. ROOT OF PERFECT SQUARES '	NC	NC	NN	CC	PN	CC	CC	CN	NC	CC
23	'SIMPLIFICATION OF SQ. ROOTS '	NN	NC	NN	CC	PN	CC	CC	CN	NN	NP
24	'ADD. & SUB. OF SQ. ROOTS '	NN	NC	NN	CC	PN	CC	CN	CN	NN	NP
25	'MUL. & DIV. OF SQ. ROOTS '	NN	NC	NN	CN	PN	CC	CN	CN	NN	NP
26	'CONV. BET. RADICALS & RAT. EXPO. '	NN	NN	NN	NN	NN	CP	NN	CN	NN	NN
27	'RATIONALIZ. OF NUMERA. & DENOMI. '	NN	NN	NN	NC	NN	CP	NN	NN	NN	NP
28	'ADD. AND SUB. OF RADICAL EXPRE. '	NN	NN	NN	NN	NN	CN	NN	NN	NN	NN
29	'NUM. CALCU. W/ EXPONENTS & RAD. '	NN	NN	NN	NC	CN	CC	NN	NN	NN	NN
30	'ALGE. CALCU. W/ EXPONENTS & RAD. '	NN	NN	NN	NN	CN	CP	NN	NN	NN	NN
31	'FACTORING & SIMPLI. ALGE. EXPRE. '	NN	NN	NN	NC	CN	CC	NN	NN	NN	NN
32	'ESTIM. & APPROXI. WITH RADICALS. '	NN	NN	NN	NC	NN	CC	NN	NC	NN	NN
33	'ALGE OPERATION OF LITERAL SYMBOL '	CN	NN	NN	CC	CN	CC	CC	NN	CC	CP
34	'SIMPLIF. OF POLYNO. BY GROUPING. '	NN	NN	NN	NC	CN	CN	CC	NN	NC	CP
35	'ADD. & SUB. OF POLYNOMIALS '	NN	NN	NN	CC	CN	CN	CC	NN	NN	CP
36	'EVALUATION OF A POLYNOMIAL(1/2) '	NN	NN	NN	CC	CN	CN	CC	NN	NC	CP
37	'MUL. OF MONOMIAL WITH A POLYNO. '	NN	NN	NN	CC	CN	CN	NN	NN	NN	CP
38	'MUL. OF TWO BINOMIALS '	NN	NN	NN	NC	CN	CN	NN	NN	NN	NP
39	'DIVISION OF POLYNOMIALS '	NN	NN	NN	CC	CN	CN	NN	NN	NN	NP
40	'SQUARING A BINOMIAL '	NN	NN	NN	NC	CN	CN	NN	NN	NN	NP
41	'FACTOR. POLYNOMIALS '	NN	NN	NN	NC	CN	CN	NN	NN	NN	CP
42	'FACTOR. TRINOMIAL OVER INTEGERS '	NN	NN	NN	NN	CN	CN	NN	NN	NN	NP
43	'FACTOR. PERFECT SQ. TRINOMIALS '	NN	NN	NN	NC	CN	CN	NN	NN	NN	NP
44	'SIMPLIF. OF COMPLEX NUMBERS '	NN	NN	NN	NN	NN	CN	NN	NC	NN	NN
45	'ONE UNKNOWN WITH NUM. COEFFI. '	NN	NN	NN	CC	CC	CC	CC	CC	NN	CP
46	'ONE UNKNOWN WITH LIT. COEFFI. '	NN	NN	NN	CC	CC	CC	CC	CC	NN	NN
47	'SIMPLE LIN. EQUA. IN ONE UNKNOWN' '	NN	NN	NN	CC	CC	CC	CC	CN	NN	CP
48	'TWO UNKNOWN BY ELIMINATION '	NN	NN	NN	NN	NN	CC	CN	NN	NN	NP
49	'TWO UNKNOWN BY SUBSTITUTION '	NN	NN	NN	NN	NN	CC	CN	NN	NN	NP
50	'APPLICATION OF EQUATIONS '	NN	NN	NN	NN	CC	CC	CC	CC	NN	CP

TABLE A-1 (continued)

ITEMS	COURSE: / TEACHER:	LOWER THAN PRE-ALGEBRA T16	T17	T18	MATH A T1	T3	PRE-ALGEBRA T5	T8	T12	T14	T20
51 'GENERATING EQUATIONS FROM DESCR.		NN	NN	NN	CC	CC	CC	CC	CN	NN	CP
52 'SOLV. EQUA. FROM FACTORED FORM		NN	NN	NN	NN	NN	NC	NN	NN	NN	NP
53 'SOLVING QUAD.EQUAT.BY FACTORING		NN	NN	NN	NN	NN	NC	NN	NN	NN	NP
54 'SOLV. QUAD. EQUA. BY QUADRATIC		NN	NN	NN	NN	NN	NC	NN	NN	NN	NP
55 'GRAPHS OF QUADRATIC RELATIONS		NN	NN	NN	NC	NN	NC	NN	NN	NN	NN
56 'ONE UNKNOWN WITH NUM. COEFFI.		NN	NN	NN	CC	CN	CC	CC	CN	NN	CP
57 'SOLUT. OF QUADRATIC INEQUALITIES		NN	NN	NN	NC	NN	CC	NN	CN	NN	NN
58 'GRAPHING LIN. INEQ. IN ONE UNKNO'		NN	NN	NN	CC	CN	CC	CC	CC	NN	NN
59 'SIMPLIF. OF A RATIONAL EXPRE.		NN	NN	NN	CC	CN	CC	CC	NC	NN	CP
60 'EVALUATION OF A RATIONAL EXPRE.		NN	NN	NN	CC	CC	CC	CC	NC	NN	CP
61 'ADD. & SUB. OF RATIONAL EXPRE.		NN	NN	NN	CC	CN	CC	CC	NC	NN	CP
62 'MUL. & DIV. OF RATIONAL EXPRE.		NN	NN	NN	CC	NN	CC	CC	NC	NN	CP
63 'PROBABILITY		CC	CN	NN	CC	CC	NN	NN	CC	NN	NN
64 'DESCRIPTIVE STATISTICS		CC	CN	NN	NC	CC	NN	NN	CC	NN	NN
65 'GRAPH READING		CC	CC	NN	CC	CN	CC	CC	CC	NC	CP
66 'LOCATI. OF POINTS IN CORD. PLANE'		CC	CC	NN	CC	CN	CC	CC	CC	NC	CP
67 'DISTANCE BET. TWO POINTS IN COR.		CC	CC	NN	NC	NN	CC	CC	CC	NC	NC
68 'PERIMETER & AREA OF TRIANGLES,SQ		CC	CC	CC	CC	CN	CC	CC	CC	CC	CC
69 'CIRCUMFERENCE & AREA OF CIRCLE		CN	CC	NC	CC	CN	CC	CC	CC	CC	CC
70 'VOL. OF CUBES, CYLINDERS,RECTAN.		NN	CC	NC	CC	NN	CC	NC	CC	NN	NC
71 'FINDING SUM OF INTERIOR ANGLES		CN	CC	NN	NC	NC	NN	NC	CC	CC	NC
72 'ISOSCELES & EQUILATERAL TRIANGLE		CN	CC	NN	NC	NC	NC	NC	CN	CC	NC
73 'APPLIC. , CONGRUENT TRIANGLES		CN	CC	NN	NC	NN	NC	NN	CN	CC	NC
74 'APPLIC. , SIMPLE TRIANGLES		CN	CC	NN	NC	NN	NC	NN	CN	CC	NC
75 'PYTHAGOREAN THEOREM & SPECI. TR.		NN	NC	NN	NC	NC	CC	NN	CC	NC	NC
76 'PARALLELISM & PERPENDICULARITY		NN	CC	NN	NN	NC	NN	NN	CN	CC	NC
77 'PROOFS(FORMAL DEDUCTIVE DEMONST.		NN	NN	NN	NN	NN	NN	NN	NN	NN	NC
78 'TRANSFORMATIONS(TRANSLATION.		NN	NN	NN	NN	NN	NN	NC	NN	NN	NN
79 'VECTORS		NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
80 'SIMPLIF. & EVALU. OF EXPRESS.		NN	NC	NN	CC	NN	CC	CC	CN	NN	NP
81 'SOLUTION OF EQUATIONS		NN	NC	NN	NC	NN	CC	NN	CN	NN	NP
82 'FUNCT. CONCEPT & USE OF NOTATION'		NN	NN	NN	CC	CN	CN	NN	NN	NN	CN
83 'FUNCT. EVALUATION USING SUBSTIT.		NN	NN	NN	CC	CN	CN	NN	NN	NN	CN
84 'COMPOSITION OF FUNCTION		NN	NN	NN	NN	NN	CN	NN	NN	NN	NN
85 'GRAPHING OF FUNCTION		NN	NN	NN	NN	NN	CN	NN	NN	NN	NN
86 'NUMERICAL FUNCTIONAL EVALUATION"		NN	NN	NN	NN	CN	NN	NN	NN	NN	NN
87 'SUBSTITUTING LITERAL EXPRESS.		NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
88 'DEFINITION, LAWS & RULES		NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
89 'INVERSE RELATION BET. LOG. & EXP		NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
90 'SOLUTION OF LOG. AND EXP. FUNCT.		NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
91 'GRAPHING OF LOG. AND EXP. FUNCT.		NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
92 'FIND. ALGEBRAIC EXPRESS		NN	NN	NN	NN	NN	NN	NN	NN	NN	NC
93 'DESCRIB. VARIATIONS OF FUNCTION		NN	NN	NN	NN	NN	NN	NN	NN	NN	NC
94 'FIND. SIDE LENGTHS IN SPEC.TRIA.'		NN	NN	NN	NC	NN	NN	NN	NN	NN	NC
95 'GRAPHING TRIGONOMETRIC FUNCTIONS		NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
96 'REDUCING TRIGONOMETRIC EXPRE.		NN	NN	NN	NN	NN	NN	NN	NN	NN	NN
97 'PROOF OF TRIGONOMETRIC IDENTITIE		NN	NN	NN	NN	NN	NN	NN	NN	NN	NN

TABLE A-2 1989/1989 TEACHER CONTENT COVERAGE BY SAME TEACHER SAME COURSES ACROSS YEARS
(Elementary Algebra Test)

ITEMS	COURSE: / TEACHER:	ALGEBRA I							GEOMETRY			
		T4	T10	T11	T13	T14	T15	T19	T4	T7	T9	T15
1	'BASIC OPERATIONS WITH SIGNED NO. '	CC	CC	PC	PC	CP	CP	CC	PP	PP	PP	PC
2	'PRIME FACTORIZATION '	CC	CC	PC	CP	CP	CP	CC	PP	PC	PP	PC
3	'FINDING DISTANCES ON NUMBER LINE '	CC	CC	PC	PP	CP	CP	CC	CC	PC	PC	PC
4	'USING DEFINITION OF DIVISIBILITY '	CC	PP	PC	PP	PP	CP	CC	CP	PP	PP	PC
5	'ADD. & SUB. OF FRACTIONS '	CC	CC	PC	PC	PP	PP	PP	PP	PC	PP	PP
6	'MUL. & DIV. OF FRACTIONS '	CC	CC	PC	PC	PP	PP	PP	PP	PC	PP	PP
7	'ORDER & COMPARISON OF FRACTIONS '	CC	CC	PC	PC	PP	PP	PP	PP	PP	PP	PP
8	'SIMPLIF. OF COMPLEX FRACTIONS '	CC	CC	PC	CC	PP	PP	CC	PP	PC	NC	PP
9	'ADD. & SUB OF DECIMALS '	CP	CC	PC	PC	PP	PP	PP	PP	PC	PP	PP
10	'MUL. & DIV. OF DECIMALS '	CP	CC	PC	PC	PP	PP	PP	PP	PC	PP	PP
11	'ESTIMATION & APPROXIMATION '	CP	CC	PN	PC	PP	PP	PP	PP	PC	CP	PP
12	'CONV. BET. FRACTIONS & DECIMALS '	CC	CC	PP	PC	PP	PP	PP	PP	PC	PP	PP
13	'CONV. BET. FRACTIONS & PERCENT '	CC	CP	PP	PC	PP	PP	PP	PP	PC	PP	PP
14	'COMPUT. WITH DECI & FRAC, ROUND. '	CC	CC	PP	PC	PP	PP	PC	PP	PC	PP	PP
15	'COMPUTATION OF PERCENT '	CC	CC	PC	PP	CP	PP	CN	PP	PC	PP	PP
16	'CONCEPT OF PROPORTION '	CC	CC	PC	PP	CP	PP	CC	CP	PC	CC	PP
17	'COMPUTATION OF PROPORTIONS '	CC	CP	PC	PP	CP	PP	CC	CP	PC	CC	PP
18	'APPLIC. OF RATIO OR PROPORTIONS '	CC	CC	PC	CP	CP	PP	CC	CP	PC	CC	PP
19	'APPLIC. LAWS OF EXPONENTS '	CC	CC	NC	CC	CC	CC	CC	PP	PC	PP	PC
20	'POWERS OF 10 & SCIENTIFIC NOTAT. '	CC	CC	NP	CC	CC	CC	CC	CC	PP	PN	PC
21	'EXPONENT. WITH INTEGRAL EXPONEN. '	CC	CC	NC	CC	CC	CC	CC	CC	PP	PP	PC
22	'SQ. ROOT OF PERFECT SQUARES '	CC	CC	PP	CC	NN	PC	CC	CC	PC	CC	PC
23	'SIMPLIFICATION OF SQ. ROOTS '	CC	CC	NC	CC	NN	PC	CC	CC	PC	CC	PC
24	'ADD. & SUB. OF SQ. ROOTS '	CC	CC	NC	CC	NN	PC	CC	CC	PP	CC	PC
25	'MUL. & DIV. OF SQ. ROOTS '	CC	CC	NC	CC	NN	PC	CC	CC	PP	CC	PC
26	'CONV. BET. RADICALS & RAT. EXPO. '	CC	CC	CN	CC	NN	CC	CC	PP	CC	CC	PN
27	'RATIONALIZ. OF NUMERA. & DENOMI. '	CC	CC	CN	CC	NN	CC	CC	PP	CC	CC	PN
28	'ADD. AND SUB. OF RADICAL EXPRE. '	CC	CC	CN	CC	NN	CC	CC	PP	CP	NN	PN
29	'NUM. CALCU. W/ EXPONENTS & RAD. '	CC	CC	CN	CC	NN	CC	CC	PP	CC	NP	PN
30	'ALGE. CALCU. W/ EXPONENTS & RAD. '	CC	CC	CN	CC	NN	CC	CN	PP	CC	NN	PN
31	'FACTORING & SIMPLI. ALGE. EXPRE. '	CC	CC	CN	CN	NN	CC	CN	PP	CC	NC	PN
32	'ESTIM. & APPROXI. WITH RADICALS. '	CC	CC	CN	CN	NN	CC	CC	PP	CN	NC	PN
33	'ALGE OPERATION OF LITERAL SYMBOL '	CC	CC	CC	CC	CC	CP	CC	PP	PP	PP	PC
34	'SIMPLIF. OF POLYNO. BY GROUPING. '	CC	CC	CC	CC	CC	CP	CC	PP	PP	PP	PC
35	'ADD. & SUB. OF POLYNOMIALS '	CC	CC	CC	CC	CC	CP	CC	PP	PP	PP	PC
36	'EVALUATION OF A POLYNOMIAL(1/2) '	CC	CC	CC	CC	CC	CP	CC	PP	PP	PC	PC
37	'MUL. OF MONOMIAL WITH A POLYNO. '	CC	CC	CC	CC	CC	CP	CC	PP	PP	PP	PC
38	'MUL. OF TWO BINOMIALS '	CC	CC	CC	CC	CC	CP	CC	PP	PP	PP	PC
39	'DIVISION OF POLYNOMIALS '	CC	CC	CC	CC	CC	CP	CC	PP	PP	NN	PN
40	'SQUARING A BINOMIAL '	CC	CC	CC	CC	CC	CP	CC	PP	PP	PP	PC
41	'FACTOR. POLYNOMIALS '	CC	CC	CC	CC	CC	CP	CC	PP	PP	PP	PC
42	'FACTOR. TRINOMIAL OVER INTEGERS '	CC	CC	CC	CC	CC	CP	CC	PP	PP	PP	PC
43	'FACTOR. PERFECT SQ. TRINOMIALS '	CC	CC	CC	CC	CC	CP	CC	PP	PP	PP	PC
44	'SIMPLIF. OF COMPLEX NUMBERS '	CC	CC	CC	CC	CC	CP	CC	PP	PP	NN	PC
45	'ONE UNKNOWN WITH NUM. COEFFI. '	CC	CC	CC	CC	CC	CP	CC	PP	PP	PC	PC
46	'ONE UNKNOWN WITH LIT. COEFFI. '	CC	CC	CC	CC	CC	CP	CC	PP	PP	NN	PC
47	'SIMPLE LIN. EQUA. IN ONE UNKNOWN '	CC	CC	CC	CC	CC	CP	CC	PP	PP	PC	PC
48	'TWO UNKNOWN BY ELIMINATION '	CC	CC	CC	CC	CN	CP	CC	PP	PP	PP	PC
49	'TWO UNKNOWN BY SUBSTITUTION '	CC	CC	CC	CC	CN	CP	CC	PP	PP	PP	PC
50	'APPLICATION OF EQUATIONS '	CC	CC	CC	CC	CC	CP	CC	PP	PP	CC	PC

TABLE A-2 (continued)

ITEMS	COURSE: / TEACHER:	ALGEBRA I							GEOMETRY			
		T4	T10	T11	T13	T14	T15	T19	T4	T7	T9	T15
51 'GENERATING EQUATIONS FROM DESCR. '		CC	NC	CC	CC	CC	CP	CC	PP	PP	CC	PC
52 'SOLV. EQUA. FROM FACTORED FORM '		CC	CC	NC	CC	NN	CP	CC	PP	PN	PC	PN
53 'SOLVING QUAD.EQUAT.BY FACTORING '		CC	CC	NC	CC	[illegible]	CP	CC	PP	PN	CC	PN
54 'SOLV. QUAD. EQUA. BY QUADRATIC '		CC	CC	NC	CN	NN	CP	CC	PP	PN	NN	PN
55 'GRAPHS OF QUADRATIC RELATIONS '		CC	CC	NN	NN	NN	CP	CC	PP	PN	NN	PN
56 'ONE UNKNOWN WITH NUM. COEFFI. '		CC	CC	CC	CC	CC	CP	CC	PP	PN	PP	PN
57 'SOLUT. OF QUADRATIC INEQUALITIES '		CC	CC	CC	CN	NN	CP	CC	PP	PN	NN	PN
58 'GRAPHING LIN. INEQ. IN ONE UNKNO '		CC	CC	CN	CN	CN	CP	CC	PP	PN	PP	PN
59 'SIMPLIF. OF A RATIONAL EXPRE. '		CC	CC	CC	CC	CC	CP	CC	PP	PN	PP	PC
60 'EVALUATION OF A RATIONAL EXPRE. '		CC	CC	CC	CC	CC	CC	CC	PP	PN	PP	PC
61 'ADD. & SUB. OF RATIONAL EXPRE. '		CC	CC	CC	CC	CC	CP	CC	PP	PN	PP	PC
62 'MUL. & DIV. OF RATIONAL EXPRE. '		CC	CC	CC	CC	CC	CP	CC	PP	PN	PP	PC
63 'PROBABILITY '		NC	NN	CN	NN	NN	CC	NN	NN	NN	NN	CC
64 'DESCRIPTIVE STATISTICS '		NC	NN	NN	NN	NN	CC	NN	NN	NN	NN	CC
65 'GRAPH READING '		CC	PC	CN	NN	CN	CP	CN	PC	CN	PP	CC
66 'LOCATI. OF POINTS IN CORD. PLANE '		CC	PC	CN	NN	CN	CP	CC	PC	CC	PC	CC
67 'DISTANCE BET. TWO POINTS IN COR. '		CC	PC	CN	NN	CC	CC	CC	PC	CC	CC	CN
68 'PERIMETER & AREA OF TRIANGLES,SQ '		CC	PC	CP	NC	CP	CP	PC	CC	CC	CC	CC
69 'CIRCUMFERENCE & AREA OF CIRCLE '		NN	PP	CP	NC	PP	CP	NC	CC	CC	CC	CC
70 'VOL. OF CUBES, CYLINDERS,RECTAN. '		NN	PP	CP	NN	NN	CP	NN	CC	CC	CC	CC
71 'FINDING SUM OF INTERIOR ANGLES '		NC	PP	NN	NC	CP	NP	NN	CC	CC	CC	CN
72 'ISOSCELES & EQUILATERAL TRIANGLE '		NC	PP	NN	NC	PP	NP	NN	CC	CC	CC	CN
73 'APPLIC. , CONGRUENT TRIANGLES '		NC	PP	NN	NN	PP	NP	NN	CC	CC	CC	CN
74 'APPLIC. , SIMPLE TRIANGLES '		NN	PP	NN	NN	PP	NP	NN	CC	CC	CC	CN
75 'PYTHAGOREAN THEOREM & SPECI. TR. '		NC	PP	CN	NC	NN	NP	NN	CC	CC	CC	CN
76 'PARALLELISM & PERPENDICULARITY '		NC	PP	CN	NN	PN	NP	NC	CC	CC	CC	CN
77 'PROOFS(FORMAL DEDUCTIVE DEMONST.'		NC	PN	NN	NN	NN	NP	NN	CC	CC	CC	CN
78 'TRANSFORMATIONS(TRANSLATION. '		NN	PN	NN	NN	NN	NP	NN	NN	CN	NC	CN
79 'VECTORS '		NN	PN	NN	NN	NN	NP	NN	NN	CN	NN	CN
80 'SIMPLIF. & EVALU. OF EXPRESS. '		CC	NC	CC	CC	NN	NP	NN	PP	NN	PP	CC
81 'SOLUTION OF EQUATIONS '		CC	NC	CC	CC	CC	CP	CC	PP	NN	NN	CC
82 'FUNCT. CONCEPT & USE OF NOTATION '		CC	CC	CN	CN	NN	CC	NC	PP	NN	NP	PC
83 'FUNCT. EVALUATION USING SUBSTIT. '		CC	CC	CN	NN	NN	CC	NC	PP	NN	NN	PC
84 'COMPOSITION OF FUNCTION '		NC	CC	CN	NN	NN	CC	NC	NP	NN	NN	PC
85 'GRAPHING OF FUNCTION '		NC	CC	CN	NN	NN	NP	NN	NP	NN	NC	PC
86 'NUMERICAL FUNCTIONAL EVALUATION '		NN	CC	NN	NN	NN	NP	NN	NN	NN	NN	CN
87 'SUBSTITUTING LITERAL EXPRESS. '		NN	CC	NN	NN	NN	NP	NN	NN	NN	NN	CN
88 'DEFINITION, LAWS & RULES '		NN	CC	NN	NN	NN	NP	NN	NN	NN	NN	CN
89 'INVERSE RELATION BET. LOG. & EXP '		NN	CC	NN	NN	NN	NP	NN	NN	NN	NN	CN
90 'SOLUTION OF LOG. AND EXP. FUNCT. '		NN	CC	NN	NN	NN	NP	NN	NN	NN	NN	CN
91 'GRAPHING OF LOG. AND EXP. FUNCT. '		NN	CC	NN	NN	NN	NP	NN	NN	NN	NN	CN
92 'FIND. ALGEBRAIC EXPRESS '		NN	CN	NN	NN	NN	NP	NN	NN	NN	NN	CN
93 'DESCRIB. VARIATIONS OF FUNCTION '		NN	CN	NN	NN	NN	NP	NN	NN	NN	NN	CN
94 'FIND. SIDE LENGTHS IN SPEC.TRIA. '		NN	CN	NN	NN	NN	NP	NN	CN	NN	NC	CN
95 'GRAPHING TRIGONOMETRIC FUNCTIONS'		NN	CN	NN	NN	NN	NP	NN	NN	NN	NN	CN
96 'REDUCING TRIGONOMETRIC EXPRE. '		NN	CN	NN	NN	NN	NP	NN	NN	NN	NN	CN
97 'PROOF OF TRIGONOMETRIC IDENTITIE '		NN	CN	NN	NN	NN	NP	NN	NN	NN	NN	CN

Appendix B

TABLE B-1

TEACHER CONTENT COVERAGE BY SAME TEACHER DIFFERENT COURSES 1988

ITEMS	COURSE: / TEACHER:	MATH A /ALGEBRA I T1	ALGEBRA /GEOM T4	LOWER THAN PRE-ALG /PRE-ALG T5	MATH A /GEOM T7	PRE-ALG /GEOM T8
1 'BASIC OPERATIONS WITH SIGNED NO.'		CC	CP	CC	CP	CP
2 'PRIME FACTORIZATION'		CC	CP	CC	CP	CP
3 'FINDING DISTANCES ON NUMBER LINE'		CC	CC	CC	CP	CP
4 'USING DEFINITION OF DIVISIBILITY'		CC	CC	CC	CP	CP
5 'ADD. & SUB. OF FRACTIONS'		CC	CP	CC	CP	CP
6 'MUL. & DIV. OF FRACTIONS'		CC	CP	CC	CP	CP
7 'ORDER & COMPARISON OF FRACTIONS'		CC	CP	CC	CP	CP
8 'SIMPLIF. OF COMPLEX FRACTIONS'		CC	CP	CC	CP	CP
9 'ADD. & SUB OF DECIMALS'		CP	CP	CC	CP	CP
10 'MUL. & DIV. OF DECIMALS'		CP	CP	CC	CP	CP
11 'ESTIMATION & APPROXIMATION'		CP	CP	CC	CP	CP
12 'CONV. BET. FRACTIONS & DECIMALS '		CP	CP	CC	CP	CP
13 'CONV. BET. FRACTIONS & PERCENT'		CP	CP	CC	CP	CP
14 'COMPUT. WITH DECI & FRAC, ROUND'		CP	CP	CC	CP	CP
15 'COMPUTATION OF PERCENT'		CC	CP	CC	CP	CC
16 'CONCEPT OF PROPORTION'		CC	CC	CC	CP	CC
17 'COMPUTATION OF PROPORTIONS'		CC	CC	CC	CP	CC
18 'APPLIC. OF RATIO OR PROPORTIONS'		CC	CC	CC	CP	CC
19 'APPLIC. LAWS OF EXPONENTS'		CC	CP	NC	CP	NC
20 'POWERS OF 10 & SCIENTIFIC NOTAT.'		CC	CP	NC	NP	NN
21 'EXPONENT. WITH INTEGRAL EXPONEN.'		CC	CP	NC	NP	NN
22 'SQ. ROOT OF PERFECT SQUARES'		CC	CC	CC	NP	CC
23 'SIMPLIFICATION OF SQ. ROOTS'		CC	CC	CC	NP	CC
24 'ADD. & SUB. OF SQ. ROOTS'		CC	CC	NC	NP	CC
25 'MUL. & DIV. OF SQ. ROOTS'		CC	CC	NC	NP	CC
26 'CONV. BET. RADICALS & RAT. EXPO.'		NC	CP	NC	NC	NN
27 'RATIONALIZ. OF NUMERA. & DENOMI.'		NC	CP	NC	NC	NC
28 'ADD. AND SUB. OF RADICAL EXPRE. '		NC	CP	NC	NC	NC
29 'NUM. CALCU. W/ EXPONENTS & RAD. '		NC	CP	NC	NC	NC
30 'ALGE. CALCU. W/ EXPONENTS & RAD.'		NC	CP	NC	NC	NN
31 'FACTORING & SIMPLI. ALGE. EXPRE.'		NC	CP	NC	NC	NN
32 'ESTIM. & APPROXI. WITH RADICALS.'		NC	CP	NC	NC	NC
33 'ALGE OPERATION OF LITERAL SYMBOL'		CC	CP	NC	NP	CC
34 'SIMPLIF. OF POLYNO. BY GROUPING.'		NC	CP	NC	NP	CC
35 'ADD. & SUB. OF POLYNOMIALS'		CC	CP	NC	NP	CC
36 'EVALUATION OF A POLYNOMIAL(1/2) '		CC	CP	NC	NP	CC
37 'MUL. OF MONOMIAL WITH A POLYNO. '		CC	CP	NC	NP	NC
38 'MUL. OF TWO BINOMIALS'		NC	CP	NC	NP	NC
39 'DIVISION OF POLYNOMIALS'		CC	CP	NC	NP	NC
40 'SQUARING A BINOMIAL'		NC	CP	NC	NP	NC
41 'FACTOR. POLYNOMIALS'		NC	CP	NC	NP	NC
42 'FACTOR. TRINOMIAL OVER INTEGERS '		NC	CP	NC	NP	NC
43 'FACTOR. PERFECT SQ. TRINOMIALS '		NC	CP	NC	NP	NC
44 'SIMPLIF. OF COMPLEX NUMBERS'		NC	CP	NC	NP	NC
45 'ONE UNKNOWN WITH NUM. COEFFI.'		CC	CP	CC	NP	CC
46 'ONE UNKNOWN WITH LIT. COEFFI.'		CC	CP	CC	NP	CC
47 'SIMPLE LIN. EQUA. IN ONE UNKNOWN'		CC	CP	CC	NP	CC
48 'TWO UNKNOWN BY ELIMINATION'		NC	CP	NC	NP	CC
49 'TWO UNKNOWN BY SUBSTITUTION'		NC	CP	NC	NP	CC
50 'APPLICATION OF EQUATIONS'		NC	CP	NC	NP	CC

TABLE B-1 (continued)

ITEMS	COURSE: / TEACHER:	MATH A /ALGEBRA I T1	ALGEBRA /GEOM T4	LOWER THAN PRE-ALG /PRE-ALG T5	MATH A /GEOM T7	PRE-ALG /GEOM T8
51 'GENERATING EQUATIONS FROM DESCR.'		CC	CP	NC	NP	CC
52 'SOLV. EQUA. FROM FACTORED FORM'		NC	CP	NN	NP	NC
53 'SOLVING QUAD.EQUAT.BY FACTORING '		NC	CP	NN	NP	NC
54 'SOLV. QUAD. EQUA. BY QUADRATIC '		NC	CP	NN	NP	NC
55 'GRAPHS OF QUADRATIC RELATIONS'		NC	CP	NN	NP	NC
56 'ONE UNKNOWN WITH NUM. COEFFI.'		CC	CP	NC	NP	CC
57 'SOLUT. OF QUADRATIC INEQUALITIES'		NC	CP	NC	NP	NC
58 'GRAPHING LIN. INEQ. IN ONE UNKNO'		CC	CP	NC	NP	CC
59 'SIMPLIF. OF A RATIONAL EXPRE.'		NC	CP	NC	NP	CC
60 'EVALUATION OF A RATIONAL EXPRE. '		CC	CP	NC	NP	CC
61 'ADD. & SUB. OF RATIONAL EXPRE.'		CC	CP	NC	NP	CC
62 'MUL. & DIV. OF RATIONAL EXPRE.'		CC	CP	NC	NP	CC
63 'PROBABILITY'		CC	NN	NN	NN	NN
64 'DESCRIPTIVE STATISTICS'		NC	NN	NN	NN	NN
65 'GRAPH READING'		CC	CP	CC	NC	CC
66 'LOCATI. OF POINTS IN CORD. PLANE'		CC	CP	CC	NC	CC
67 'DISTANCE BET. TWO POINTS IN COR.'		NC	CP	NC	NC	CC
68 'PERIMETER & AREA OF TRIANGLES,SQ'		CC	CC	CC	NC	CC
69 'CIRCUMFERENCE & AREA OF CIRCLE'		CC	NC	CC	NC	CC
70 'VOL. OF CUBES, CYLINDERS,RECTAN.'		CC	NC	CC	NC	NC
71 'FINDING SUM OF INTERIOR ANGLES'		NN	NC	NN	NC	NC
72 'ISOSCELES & EQUILATERAL TRIANGLE'		NN	NC	NN	NC	NC
73 'APPLIC. , CONGRUENT TRIANGLES'		NN	NC	NN	NC	NC
74 'APPLIC. , SIMPLE TRIANGLES'		NN	NC	NN	NC	NC
75 'PYTHAGOREAN THEOREM & SPECI. TR.'		NC	NC	CC	NC	NC
76 'PARALLELISM & PERPENDICULARITY'		NC	NC	NN	NC	NC
77 'PROOFS(FORMAL DEDUCTIVE DEMONST.'		NN	NC	NN	NC	NC
78 'TRANSFORMATIONS(TRANSLATION.'		NN	NN	NN	NC	NN
79 'VECTORS'		NN	NN	NN	NC	NN
80 'SIMPLIF. & EVALU. OF EXPRESS.'		CC	CP	NC	NN	CC
81 'SOLUTION OF EQUATIONS'		NC	CP	NC	NN	NC
82 'FUNCT. CONCEPT & USE OF NOTATION'		CC	CP	NC	NN	NN
83 'FUNCT. EVALUATION USING SUBSTIT.'		CC	CP	NC	NN	NN
84 'COMPOSITION OF FUNCTION'		NN	NN	NC	NN	NN
85 'GRAPHING OF FUNCTION'		NC	NN	NC	NN	NN
86 'NUMERICAL FUNCTIONALEVALUATION'		NN	NN	NN	NN	NN
87 'SUBSTITUTING LITERAL EXPRESS.'		NN	NN	NN	NN	NN
88 'DEFINITION, LAWS & RULES'		NN	NN	NN	NN	NN
89 'INVERSE RELATION BET. LOG. & EXP'		NN	NN	NN	NN	NN
90 'SOLUTION OF LOG. AND EXP. FUNCT.'		NN	NN	NN	NN	NN
91 'GRAPHING OF LOG. AND EXP. FUNCT.'		NN	NN	NN	NN	NN
92 'FIND. ALGEBRAIC EXPRESS'		NN	NN	NN	NN	NC
93 'DESCRIB. VARIATIONS OF FUNCTION '		NN	NN	NN	NN	NC
94 'FIND. SIDE LENGTHS IN SPEC.TRIA.'		NN	NC	NN	NN	NC
95 'GRAPHING TRIGONOMETRIC FUNCTIONS'		NN	NN	NN	NN	NN
96 'REDUCING TRIGONOMETRIC EXPRE.'		NN	NN	NN	NN	NN
97. 'PROOF OF TRIGONOMETRIC IDENTITIE'		NN	NN	NN	NN	NN

TABLE B-2

TEACHER CONTENT COVERAGE BY SAME TEACHER DIFFERENT COURSES 1989

ITEMS	COURSE:	LOWER THAN PRE-ALG/ MATH A	ALG I/ GEOMETRY	LOWER THAN PRE-ALG /PRE-ALG	LOWER THAN PRE-ALG /PREALG /ALG I
	TEACHER:	T3	T4	T12	T14
1 'BASIC OPERATIONS WITH SIGNED NO.'		CC	CP	NC	NCP
2 'PRIME FACTORIZATION'		CC	CP	CC	CCP
3 'FINDING DISTANCES ON NUMBER LINE'		CC	CC	PP	NCP
4 'USING DEFINITION OF DIVISIBILITY'		CC	CP	PP	CCP
5 'ADD. & SUB. OF FRACTIONS'		PP	CP	CP	CCP
6 'MUL. & DIV. OF FRACTIONS'		PP	CP	CP	CCP
7 'ORDER & COMPARISON OF FRACTIONS'		PP	CP	CP	CCP
8 'SIMPLIF. OF COMPLEX FRACTIONS'		PP	CP	CP	CCP
9 'ADD. & SUB OF DECIMALS'		PP	CP	CP	CCP
10 'MUL. & DIV. OF DECIMALS'		PP	CP	CC	CCP
11 'ESTIMATION & APPROXIMATION'		PP	CP	CC	CCP
12 'CONV. BET. FRACTIONS & DECIMALS '		PP	CP	CC	CCP
13 'CONV. BET. FRACTIONS & PERCENT'		PP	CP	CC	CCP
14 'COMPUT. WITH DECI & FRAC, ROUND'		PP	CP	CC	CCP
15 'COMPUTATION OF PERCENT'		PP	CP	CC	CCP
16 'CONCEPT OF PROPORTION'		PP	CP	CC	CCP
17 'COMPUTATION OF PROPORTIONS'		PP	CP	CC	CCP
18 'APPLIC. OF RATIO OR PROPORTIONS'		PP	CP	CC	CCP
19 'APPLIC. LAWS OF EXPONENTS'		CC	CP	CC	NCC
20 'POWERS OF 10 & SCIENTIFIC NOTAT.'		CC	CP	CC	NCC
21 'EXPONENT. WITH INTEGRAL EXPONEN.'		CC	CP	NN	NCC
22 'SQ. ROOT OF PERFECT SQUARES'		NN	CC	NN	NCN
23 'SIMPLIFICATION OF SQ. ROOTS'		NN	CC	NN	NNN
24 'ADD. & SUB. OF SQ. ROOTS'		NN	CC	NN	NNN
25 'MUL. & DIV. OF SQ. ROOTS'		NN	CC	NN	NNN
26 'CONV. BET. RADICALS & RAT. EXPO.'		NN	CP	NN	NNN
27 'RATIONALIZ. OF NUMERA. & DENOMI.'		NN	CP	NN	NNN
28 'ADD. AND SUB. OF RADICAL EXPRE. '		NN	CP	NN	NNN
29 'NUM. CALCU. W/ EXPONENTS & RAD. '		NN	CP	NN	NNN
30 'ALGE. CALCU. W/ EXPONENTS & RAD.'		NN	CP	NN	NNN
31 'FACTORING & SIMPLI. ALGE. EXPRE.'		NN	CP	NN	NNN
32 'ESTIM. & APPROXI. WITH RADICALS.'		NN	CP	NC	NNN
33 'ALGE OPERATION OF LITERAL SYMBOL'		NN	CP	NN	NCC
34 'SIMPLIF. OF POLYNO. BY GROUPING.'		NN	CP	NN	NCC
35 'ADD. & SUB. OF POLYNOMIALS'		NN	CP	NN	NNC
36 'EVALUATION OF A POLYNOMIAL(1/2) '		NN	CP	NN	NCC
37 'MUL. OF MONOMIAL WITH A POLYNO. '		NN	CP	NN	NNC
38 'MUL. OF TWO BINOMIALS'		NN	CP	NN	NNC
39 'DIVISION OF POLYNOMIALS'		NN	CP	NN	NNC
40 'SQUARING A BINOMIAL'		NN	CP	NN	NNC
41 'FACTOR. POLYNOMIALS'		NN	CP	NN	NNC
42 'FACTOR. TRINOMIAL OVER INTEGERS '		NN	CP	NN	NNC
43 'FACTOR. PERFECT SQ. TRINOMIALS '		NN	CP	NN	NNC
44 'SIMPLIF. OF COMPLEX NUMBERS'		NN	CP	NC	NNN
45 'ONE UNKNOWN WITH NUM. COEFFI.'		CC	CP	CC	NNC
46 'ONE UNKNOWN WITH LIT. COEFFI.'		NN	CP	CC	NNC
47 'SIMPLE LIN. EQUA. IN ONE UNKNOWN'		CC	CP	CN	NNC
48 'TWO UNKNOWN BY ELIMINATION'		NN	CP	NN	NNN
49 'TWO UNKNOWN BY SUBSTITUTION'		NN	CP	NN	NNN
50 'APPLICATION OF EQUATIONS'		CC	CP	NC	NNC

TABLE B-2 (continued)

ITEMS	COURSE: / TEACHER:	LOWER THAN PRE-ALG/ MATH A T3	ALG I/ GEOMETRY T4	LOWER THAN PRE-ALG /PRE-ALG T12	LOWER THAN PRE-ALG /PREALG /ALG I T14
51 'GENERATING EQUATIONS FROM DESCR.'		CC	CP	NN	NNN
52 'SOLV. EQUA. FROM FACTORED FORM'		NN	CP	NN	NNN
53 'SOLVING QUAD.EQUAT.BY FACTORING '		NN	CP	NN	NNN
54 'SOLV. QUAD. EQUA. BY QUADRATIC '		NN	CP	NN	NNN
55 'GRAPHS OF QUADRATIC RELATIONS'		NN	CP	NN	NNC
56 'ONE UNKNOWN WITH NUM. COEFFI.'		NN	CP	NN	NNN
57 'SOLUT. OF QUADRATIC INEQUALITIES'		NN	CP	NC	NNN
58 'GRAPHING LIN. INEQ. IN ONE UNKNO'		NN	CP	NC	NNC
59 'SIMPLIF. OF A RATIONAL EXPRE.'		CC	CP	NC	NNC
60 'EVALUATION OF A RATIONAL EXPRE. '		CC	CP	NC	NNC
61 'ADD. & SUB. OF RATIONAL EXPRE.'		NN	CP	NC	NNC
62 'MUL. & DIV. OF RATIONAL EXPRE.'		NN	CP	NC	NNN
63 'PROBABILITY'		CC	CN	CC	NNN
64 'DESCRIPTIVE STATISTICS'		CC	CN	CC	NNN
65 'GRAPH READING'		NN	CC	CC	NCN
66 'LOCATI. OF POINTS IN CORD. PLANE'		NN	CC	CC	NCN
67 'DISTANCE BET. TWO POINTS IN COR.'		NN	CC	CC	NCC
68 'PERIMETER & AREA OF TRIANGLES,SQ'		NN	CC	CC	CCP
69 'CIRCUMFERENCE & AREA OF CIRCLE'		NN	NC	CC	CCP
70 'VOL. OF CUBES, CYLINDERS,RECTAN.'		NN	NC	CC	NNN
71 'FINDING SUM OF INTERIOR ANGLES'		CC	CC	NC	NCP
72 'ISOSCELES & EQUILATERAL TRIANGLE'		CC	CC	NN	NCP
73 'APPLIC. , CONGRUENT TRIANGLES'		NN	CC	NN	NCP
74 'APPLIC. , SIMPLE TRIANGLES'		NN	NC	NN	NCP
75 'PYTHAGOREAN THEOREM & SPECI. TR.'		CC	CC	NC	NCN
76 'PARALLELISM & PERPENDICULARITY'		CC	CC	NN	NCN
77 'PROOFS(FORMAL DEDUCTIVE DEMONST.'		NN	CC	NN	NNN
78 'TRANSFORMATIONS(TRANSLATION.'		NN	NN	NN	NNN
79 'VECTORS'		NN	NN	NN	NNN
80 'SIMPLIF. & EVALU. OF EXPRESS.'		NN	CP	NN	NNC
81 'SOLUTION OF EQUATIONS'		NN	CP	NN	NNC
82 'FUNCT. CONCEPT & USE OF NOTATION'		NN	CP	NN	NNN
83 'FUNCT. EVALUATION USING SUBSTIT.'		NN	CP	NN	NNN
84 'COMPOSITION OF FUNCTION'		NN	CP	NN	NNN
85 'GRAPHING OF FUNCTION'		NN	CP	NN	NNN
86 'NUMERICAL FUNCTIONALEVALUATION'		NN	NN	NN	NNN
87 'SUBSTITUTING LITERAL EXPRESS.'		NN	NN	NN	NNN
88 'DEFINITION, LAWS & RULES'		NN	NN	NN	NNN
89 'INVERSE RELATION BET. LOG. & EXP'		NN	NN	NN	NNN
90 'SOLUTION OF LOG. AND EXP. FUNCT.'		NN	NN	NN	NNN
91 'GRAPHING OF LOG. AND EXP. FUNCT.'		NN	NN	NN	NNN
92 'FIND. ALGEBRAIC EXPRESS'		NN	NN	NN	NNN
93 'DESCRIB. VARIATIONS OF FUNCTION '		NN	NN	NN	NNN
94 'FIND. SIDE LENGTHS IN SPEC.TRIA.'		NN	NC	NN	NNN
95 'GRAPHING TRIGONOMETRIC FUNCTIONS'		NN	NN	NN	NNN
96 'REDUCING TRIGONOMETRIC EXPRE.'		NN	NN	NN	NNN
97 'PROOF OF TRIGONOMETRIC IDENTITIE'		NN	NN	NN	NNN

Appendix C

TABLE C-1

ALGEBRA READINESS TEST MATH A (TEACHER 1) P-VALUES

ITEMS	1988	1989	'88-'89	CONTENT COVERAGE
1 'ADD. & SUB OF DECIMALS'	.346	.451	-.105	CP
2. 'MUL. & DIV. OF FRACTIONS'	.404	.549	-.145	CP
3. 'ADD. & SUB OF DECIMALS'	.596	.569	.027	CP
4. 'EVALUATION OF A POLYNOMIAL(1/2)'	.481	.549	-.068	CC
5. 'BASIC OPERATIONS WITH SIGNED NO.'	.654	.735	-.081	CP
6. 'GRAPH READING'	.173	.245	-.072	CC
7. 'BASIC OPERATIONS WITH SIGNED NO.'	.404	.520	-.116	CP
8. 'BASIC OPERATIONS WITH SIGNED NO.'	.654	.686	-.032	CP
9. 'FINDING DISTANCES ON NUMBER LINE'	.462	.520	-.058	CC
10.'COMPUTATION OF PERCENT'	.365	.431	-.066	CP
11 'MUL. & DIV. OF FRACTIONS'	.385	.431	-.046	CP
12 'PRIME FACTORIZATION'	.250	.186	.064	CC
13 'ONE UNKNOWN WITH NUM. COEFFI.'	.481	.569	-.088	CC
14 'ONE UNKNOWN WITH NUM. COEFFI.'	.538	.578	-.040	CC
15 'EVALUATION OF A POLYNOMIAL(1/2)'	.538	.588	-.050	CC
16 'MUL. & DIV. OF FRACTIONS'	.250	.363	-.113	CP
17 'MUL. & DIV. OF DECIMALS'	.519	.490	.029	CP
18.'ADD. & SUB. OF FRACTIONS'	.250	.179	.074	CP
19 'MUL. & DIV. OF FRACTIONS'	.327	.275	.052	CP
20 'PRIME FACTORIZATION'	.385	.353	.032	CC
21 'BASIC OPERATIONS WITH SIGNED NO.'	.173	.173	.026	CP
22 'BASIC OPERATIONS WITH SIGNED NO.'	.231	.255	-.024	CP
23 'SQ. ROOT OF PERFECT SQUARES'	.231	.294	-.063	CC
24 'EVALUATION OF A POLYNOMIAL(1/2)'	.269	.245	.024	CC
25 'MUL. & DIV. OF DECIMALS'	.346	.431	-.085	CP
26 'CONV. BET. FRACTIONS & PERCENT'	.308	.245	.063	CP
27 'BASIC OPERATIONS WITH SIGNED NO.'	.192	.333	-.141	CP
28 'SIMPLIF. OF A RATIONAL EXPRE.'	.423	.324	.099	NC
29 'MUL. & DIV. OF FRACTIONS"	.365	.235	.130	CP
30 'APPLIC. OF RATIO OR PROPORTIONS'	.288	.314	-.026	CC
31 'SIMPLIF. OF COMPLEX FRACTIONS'	.192	.373	-.181	CP
32.'ESTIMATION & APPROXIMATION'	.404	.500	-.096	CP
33 'ALGE OPERATION OF LITERAL SYMBOL'	.135	.127	.008	CC
34 'EXPONENT. WITH INTEGRAL EXPONEN.'	.231	.118	.113	CC
35 'FINDING DISTANCES ON NUMBER LINE'	.231	.314	-.083	CC
36.'LOCATI. OF POINTS IN CORD. PLANE'	.212	.373	-.161	CC
37.'ORDER & COMPARISON OF FRACTIONS'	.173	.147	.026	CP
38.'PERIMETER & AREA OF TRIANGLES, SQ'	.288	.284	.004	CC
39.'PYTHAGOREAN THEOREM & SPECI. TR.'	.096	.216	-.120	NC
40.'POWERS OF 10 & SCIENTIFIC NOTAT.'	.231	.324	-.093	CC
41.'ORDER & COMPARISON OF FRACTIONS'	.231	.284	-.053	CP
42.'ADD. & SUB. OF FRACTIONS'	.058	.098	-.040	CP
43.'ADD. & SUB. OF FRACTIONS'	.038	.118	-.080	CP
44.'COMPUTATION OF PERCENT'	.115	.147	-.032	CP
45.'COMPUT. WITH DECI & FRAC, ROUND.'	.269	.196	.073	CP
46.'CIRCUMFERENCE & AREA OF CIRCLE'	.115	.147	-.032	CC
47.'BASIC OPERATIONS WITH SIGNED NO.'	.212	.255	-.043	CP
48.'SQ. ROOT OF PERFECT SQUARES'	.096	.137	-.041	CC
49.'PERIMETER & AREA OF TRIANGLES, SQ'	.115	.167	-.052	CC
50.'APPLIC., SIMPLE TRIANGLES'	.173	.147	.026	NC

TABLE C-2

ALGEBRA READINESS TEST PRE-ALGEBRA (TEACHER 14) P-VALUES

ITEMS	1988	1989	'88-'89	CONTENT COVERAGE
1 'ADD. & SUB OF DECIMALS'	.455	.600	-.145	CC
2. 'MUL. & DIV. OF FRACTIONS'	.782	.800	-.018	CC
3. 'ADD. & SUB OF DECIMALS'	.764	.711	.053	CC
4. 'EVALUATION OF A POLYNOMIAL(1/2)'	.527	.600	-.073	NC
5. 'BASIC OPERATIONS WITH SIGNED NO.'	.800	.844	-.044	CC
6. 'GRAPH READING'	.327	.244	.083	NC
7. 'BASIC OPERATIONS WITH SIGNED NO.'	.436	.644	-.208	CC
8. 'BASIC OPERATIONS WITH SIGNED NO.'	.636	.667	-.031	CC
9. 'FINDING DISTANCES ON NUMBER LINE'	.600	.689	-.089	NC
10.'COMPUTATION OF PERCENT'	.545	.467	.078	CC
11 'MUL. & DIV. OF FRACTIONS'	.709	.622	.087	CC
12 'PRIME FACTORIZATION'	.455	.489	-.034	CC
13 'ONE UNKNOWN WITH NUM. COEFFI.'	.709	.644	.065	NN
14 'ONE UNKNOWN WITH NUM. COEFFI.'	.600	.733	-.133	NN
15 'EVALUATION OF A POLYNOMIAL(1/2)'	.564	.667	-.103	NC
16 'MUL. & DIV. OF FRACTIONS'	.345	.356	-.011	CC
17 'MUL. & DIV. OF DECIMALS'	.527	.600	-.073	CC
18.'ADD. & SUB. OF FRACTIONS'	.364	.400	-.036	CC
19 'MUL. & DIV. OF FRACTIONS'	.400	.333	.067	CC
20 'PRIME FACTORIZATION'	.600	.644	-.044	CC
21 'BASIC OPERATIONS WITH SIGNED NO.'	.364	.289	.075	CC
22 'BASIC OPERATIONS WITH SIGNED NO.'	.291	.244	.047	CC
23 'SQ. ROOT OF PERFECT SQUARES'	.164	.267	-.103	NC
24 'EVALUATION OF A POLYNOMIAL(1/2)'	.291	.200	.091	NC
25 'MUL. & DIV. OF DECIMALS'	.236	.378	-.142	CC
26 'CONV. BET. FRACTIONS & PERCENT'	.764	.711	.053	CC
27 'BASIC OPERATIONS WITH SIGNED NO.'	.309	.356	-.047	CC
28 'SIMPLIF. OF A RATIONAL EXPRE.'	.364	.289	.075	NN
29 'MUL. & DIV. OF FRACTIONS'	.273	.244	.029	CC
30 'APPLIC. OF RATIO OR PROPORTIONS'	.309	.444	-.135	CC
31 'SIMPLIF. OF COMPLEX FRACTIONS'	.236	.333	-.097	CC
32.'ESTIMATION & APPROXIMATION'	.364	.467	-.103	CC
33 'ALGE OPERATION OF LITERAL SYMBOL'	.073	.044	.029	CC
34 'EXPONENT. WITH INTEGRAL EXPONEN.'	.145	.244	-.099	NC
35 'FINDING DISTANCES ON NUMBER LINE'	.273	.378	-.105	NC
36.'LOCATI. OF POINTS IN CORD. PLANE'	.182	.333	-.151	NC
37.'ORDER & COMPARISON OF FRACTIONS'	.164	.200	-.036	CC
38.'PERIMETER & AREA OF TRIANGLES, SQ'	.218	.200	.018	CC
39.'PYTHAGOREAN THEOREM & SPECI. TR.'	.200	.133	.140	CC
40.'POWERS OF 10 & SCIENTIFIC NOTAT.'	.273	.133	-.093	CC
41.'ORDER & COMPARISON OF FRACTIONS'	.145	.044	.101	CC
42.'ADD. & SUB. OF FRACTIONS'	.055	.133	-.078	CC
43.'ADD. & SUB. OF FRACTIONS'	.036	.067	-.031	CC
44.'COMPUTATION OF PERCENT'	.073	.044	.029	CC
45.'COMPUT. WITH DECI & FRAC, ROUND.'	.182	.178	.004	CC
46.'CIRCUMFERENCE & AREA OF CIRCLE'	.073	.067	.006	CC
47.'BASIC OPERATIONS WITH SIGNED NO.'	.055	.111	-.056	CC
48.'SQ. ROOT OF PERFECT SQUARES'	.073	.044	.029	NC
49.'PERIMETER & AREA OF TRIANGLES, SQ'	.055	.044	.011	CC
50.'APPLIC., SIMPLE TRIANGLES'	.073	.044	.029	CC

TABLE C-3

ALGEBRA READINESS TEST LOWER THAN PRE-ALGEBRA (TEACHER 17) P-VALUES

ITEMS	1988	1989	'88-'89	CONTENT COVERAGE
1 'ADD. & SUB OF DECIMALS'	.400	.368	.032	CP
2. 'MUL. & DIV. OF FRACTIONS'	.600	.588	.012	CP
3. 'ADD. & SUB OF DECIMALS'	.360	.485	-.125	CP
4. 'EVALUATION OF A POLYNOMIAL(1/2)'	.320	.375	-.055	NN
5. 'BASIC OPERATIONS WITH SIGNED NO.'	.600	.684	-.084	CC
6. 'GRAPH READING'	.160	.184	-.024	CC
7. 'BASIC OPERATIONS WITH SIGNED NO.'	.320	.588	.172	CC
8. 'BASIC OPERATIONS WITH SIGNED NO.'	.760	.667	-.031	CC
9. 'FINDING DISTANCES ON NUMBER LINE'	.400	.493	-.093	CC
10.'COMPUTATION OF PERCENT'	.760	.449	.311	CP
11 'MUL. & DIV. OF FRACTIONS'	.560	.390	.170	CP
12 'PRIME FACTORIZATION'	.520	.316	.204	CC
13 'ONE UNKNOWN WITH NUM. COEFFI.'	.480	.529	-.049	NN
14 'ONE UNKNOWN WITH NUM. COEFFI.'	.640	.537	.103	NN
15 'EVALUATION OF A POLYNOMIAL(1/2)'	.400	.500	-.100	NN
16 'MUL. & DIV. OF FRACTIONS'	.200	.279	-.079	CP
17 'MUL. & DIV. OF DECIMALS'	.320	.485	-.165	CP
18.'ADD. & SUB. OF FRACTIONS'	.240	.309	-.069	CP
19 'MUL. & DIV. OF FRACTIONS'	.400	.360	.040	CP
20 'PRIME FACTORIZATION'	.560	.485	.075	CC
21 'BASIC OPERATIONS WITH SIGNED NO.'	.320	.250	.070	CC
22 'BASIC OPERATIONS WITH SIGNED NO.'	.200	.228	.028	CC
23 'SQ. ROOT OF PERFECT SQUARES'	.080	.279	-.199	NC
24 'EVALUATION OF A POLYNOMIAL(1/2)'	.280	.272	.008	NN
25 'MUL. & DIV. OF DECIMALS'	.360	.404	-.044	CP
26 'CONV. BET. FRACTIONS & PERCENT'	.480	.441	.039	CP
27 'BASIC OPERATIONS WITH SIGNED NO.'	.240	.287	-.047	CC
28 'SIMPLIF. OF A RATIONAL EXPRE.'	.280	.382	-.102	NN
29 'MUL. & DIV. OF FRACTIONS"	.200	.346	-.146	CP
30 'APPLIC. OF RATIO OR PROPORTIONS'	.360	.287	.073	PP
31 'SIMPLIF. OF COMPLEX FRACTIONS'	.240	.316	-.076	CP
32.'ESTIMATION & APPROXIMATION'	.280	.419	-.139	CC
33 'ALGE OPERATION OF LITERAL SYMBOL'	.120	.074	.046	NN
34 'EXPONENT. WITH INTEGRAL EXPONEN.'	.200	.478	-.278	CP
35 'FINDING DISTANCES ON NUMBER LINE'	.320	.221	.099	CC
36.'LOCATI. OF POINTS IN CORD. PLANE'	.320	.316	.004	CC
37.'ORDER & COMPARISON OF FRACTIONS'	.320	.169	.151	CP
38.'PERIMETER & AREA OF TRIANGLES, SQ'	.240	.338	-.098	CC
39.'PYTHAGOREAN THEOREM & SPECI. TR.'	.160	.206	-.046	NC
40.'POWERS OF 10 & SCIENTIFIC NOTAT.'	.280	.368	-.088	CP
41.'ORDER & COMPARISON OF FRACTIONS'	.080	.287	-.207	CP
42.'ADD. & SUB. OF FRACTIONS'	.040	.162	-.122	CP
43.'ADD. & SUB. OF FRACTIONS'	.000	.096	-.096	CP
44.'COMPUTATION OF PERCENT'	.080	.118	-.038	CP
45.'COMPUT. WITH DECI & FRAC, ROUND.'	.120	.206	-.086	CC
46.'CIRCUMFERENCE & AREA OF CIRCLE'	.080	.103	-.023	CC
47.'BASIC OPERATIONS WITH SIGNED NO.'	.080	.272	-.192	CC
48.'SQ. ROOT OF PERFECT SQUARES'	.080	.125	-.045	NC
49.'PERIMETER & AREA OF TRIANGLES, SQ'	.000	.169	-.169	CC
50.'AFPLIC., SIMPLE TRIANGLES'	.080	.213	-.133	CC

TABLE C-4

ELEMENTARY ALGEBRA TEST ALGEBRA I (TEACHER 4) P-VALUES

ITEMS	1988	1989	'88-'89	CONTENT COVERAGE
1 'SIMPLIF. OF POLYNO. BY GROUPING'	.963	1.000	-.037	CC
2. 'CONV. BET. FRACTIONS & DECIMALS'	.963	.950	.013	CC
3. 'ESTIM. & APPROXI. WITH RADICALS.'	.407	.500	-.193	CC
4. 'EXPONENT. WITH INTEGRAL EXPONEN.'	.741	.700	.041	CC
5. 'ADD. & SUB OF DECIMALS'	.827	.700	.127	CP
6. 'SQUARING A BINOMIAL'	.914	.800	.114	CC
7. 'ISOSCELES & EQUILATERAL TRIANGLE'	.420	.300	.120	NC
8. 'EXPONENT. WITH INTEGRAL EXPONEN.'	.531	.550	-.019	CC
9. 'LOCATI. OF POINTS IN CORD. PLANE'	.563	.900	.063	CC
10.'SIMPLIF. OF A RATIONAL EXPRE.'	.642	.550	.092	CC
11 'SOLV. EQUA. FROM FACTORED FORM'	.679	.500	.179	CC
12 'MUL. OF MONOMIAL WITH A POLYNO.	.864	.700	.164	CC
13 'FACTOR. TRINOMIAL OVER INTEGERS'	.815	.750	.065	CC
14 'ONE UNKNOWN WITH NUM. COEFFI.'	.901	.700	.201	CC
15 'EVALUATION OF A POLYNOMIAL(1/2)'	.963	1.000	-.037	CC
16 'TWO UNKNOWN BY ELIMINATION'	.654	.800	-.146	CC
17 'SQ. ROOT OF PERFECT SQUARES'	.852	.600	.252	CC
18.'PYTHAGOREAN THEOREM & SPECI. TR.'	.580	.700	-.120	NC
19 'MUL. & DIV. OF FRACTIONS'	.679	.600	.079	CC
20 'GRAPHING LIN. INEQ. IN ONE UNKNOWN'	.963	.900	.063	CC
21 'COMPUTATION OF PERCENT'	.457	.600	-.143	CC
22 'ADD. & SUB. OF SQ.ROOTS'	.864	.800	.064	CC
23 'FACTOR, PERFECT SQ. TRINOMIALS'	.901	.800	.101	CC
24 'MUL. & DIV. OF SQ. ROOTS'	.778	.700	.078	CC
25 'APPLICATION OF EQUATIONS'	.864	.950	-.086	CC
26 'ONE UNKNOWN WITH NUM. COEFFI.'	.728	.750	-.022	CC
27 'EVALUATION OF RATIONAL EXPRE.'	.926	1.000	-.074	CC
28 'SIMPLIF. OF SQUARE ROOTS'	.901	.900	.001	CC
29 'ADD. & SUB. OF POLYNOMIALS'	.741	.700	.041	CC
30 'SIMPLIF. OF RATIONAL EXPRE.'	.753	.750	.003	CC
31 'PERIMETER & AREA OF TRIANGLES, SQ'	.728	.750	-.022	CC
32.'PERIMETER & AREA OF TRIANGLES, SQ'	.309	.400	-.091	CC
33 'SIMPLIF. OF A RATIONAL EXPRE.'	.753	.700	.053	CC
34 'ONE UNKNOWN WITH NUM. COEFFI.'	.704	.550	-.154	CC
35 'MUL. & DIV. OF RATIONAL EXPRE.'	.728	.550	.078	CC
36.'ONE UNKNOWN WITH NUM. COEFFI.'	.654	.600	.054	CC
37.'TWO UNKNOWN BY SUBSTITUTION'	.827	.800	.027	CC
38.'POWERS OF 10 & SCIENTIFIC NOTAT.'	.765	.600	.165	CC
39.'SOLVING QUAD. EQUAT. BY FACTORING'	.617	.600	.017	CC
40.'ADD. & SUB. OF RATIONAL EXPRE.'	.667	.450	.217	CC
41.'VOL. OF CUBES, CYLINDERS, RECTAN.'	.469	.450	.019	NN
42.'APPLIC., SIMPLE TRIANGLES'	.531	.500	.031	NN
43.'FINDING DISTANCES ON NUMBER LINE'	.272	.450	-.178	CC
44.'ONE UNKNOWN WITH LIT. COEFFI.'	.741	.550	.191	CC
45.'COMPUTATION OF PROPORTIONS'	.481	.400	.081	CC
46.'CIRCUMFERENCE & AREA OF CIRCLE'	.198	.150	.048	NN
47.'SOLVING QUAD. EQUAT. BY FACTORING'	.519	.350	.169	CC
48.'ONE UNKNOWN WITH NUM. COEFFI.	.741	.500	.241	CC
49,'ONE UNKNOWN WITH NUM. COEFFI.	.481	.450	.031	CC
50.'SOLV. QUAD. EQUA. BY QUADRATIC'	.506	.350	.156	CC

TABLE C-5

ELEMENTARY ALGEBRA TEST ALGEBRA I (TEACHER 14) P-VALUES

ITEMS	1988	1989	'89-'90	CONTENT COVERAGE
1 'SIMPLIF. OF POLYNO. BY GROUPING'	.542	.615	-.073	CC
2. 'CONV. BET. FRACTIONS & DECIMALS'	.854	.692	.162	PP
3. 'ESTIM. & APPROXI. WITH RADICALS.'	.042	.038	.004	NN
4. 'EXPONENT. WITH INTEGRAL EXPONEN.'	.312	.538	-.226	CC
5. 'ADD. & SUB OF DECIMALS'	.312	.500	-.188	PP
6. 'SQUARING A BINOMIAL'	.396	.654	-.258	CC
7. 'ISOSCELES & EQUILATERAL TRIANGLE'	.187	.231	-.044	PP
8. 'EXPONENT. WITH INTEGRAL EXPONEN.'	.104	.000	.104	CC
9. 'LOCATI. OF POINTS IN CORD. PLANE'	.604	.615	-.011	CN
10.'SIMPLIF. OF A RATIONAL EXPRE.'	.437	.615	-.178	CC
11 'SOLV. EQUA. FROM FACTORED FORM'	.229	.577	-.348	NN
12 'MUL. OF MONOMIAL WITH A POLYNO.	.625	.577	.048	CC
13 'FACTOR. TRINOMIAL OVER INTEGERS'	.437	.385	.052	CC
14 'ONE UNKNOWN WITH NUM. COEFFI.'	.437	.462	-.025	CC
15 'EVALUATION OF A POLYNOMIAL(1/2)'	.687	.615	.072	PP
16 'TWO UNKNOWN BY ELIMINATION'	.083	.115	-.032	CN
17 'SQ. ROOT OF PERFECT SQUARES'	.271	.231	.040	NN
18.'PYTHAGOREAN THEOREM & SPECI. TR.'	.562	.577	-.015	NN
19 'MUL. & DIV. OF FRACTIONS'	.229	.385	-.156	PP
20 'GRAPHING LIN. INEQ. IN ONE UNKNOWN'	.417	.462	-.045	CN
21 'COMPUTATION OF PERCENT'	.146	.154	-.008	CP
22 'ADD. & SUB. OF SQ.ROOTS'	.062	.077	-.015	NN
23 'FACTOR, PERFECT SQ. TRINOMIALS'	.417	.846	-.429	CC
24 'MUL. & DIV. OF SQ. ROOTS'	.167	.385	-.218	NN
25 'APPLICATION OF EQUATIONS'	.417	.269	.148	CC
26 'ONE UNKNOWN WITH NUM. COEFFI.'	.146	.115	.031	CC
27 'EVALUATION OF RATIONAL EXPRE.'	.396	.538	-.142	CC
28 'SIMPLIF. OF SQUARE ROOTS'	.062	.154	-.092	NN
29 'ADD. & SUB. OF POLYNOMIALS'	.167	.269	-.102	CC
30 'SIMPLIF. OF RATIONAL EXPRE.'	.354	.538	-.184	CC
31 'PERIMETER & AREA OF TRIANGLES, SQ'	.125	.346	-.221	CP
32.'PERIMETER & AREA OF TRIANGLES, SQ'	.229	.462	-.233	CP
33 'SIMPLIF. OF A RATIONAL EXPRE.'	.250	.346	-.096	CC
34 'ONE UNKNOWN WITH NUM. COEFFI.'	.104	.077	.027	CC
35 'MUL. & DIV. OF RATIONAL EXPRE.'	.271	.462	-.191	CC
36.'ONE UNKNOWN WITH NUM. COEFFI.'	.162	.077	-.015	CC
37.'TWO UNKNOWN BY SUBSTITUTION'	.104	.115	-.011	CN
38.'POWERS OF 10 & SCIENTIFIC NOTAT.'	.125	.346	-.221	CC
39.'SOLVING QUAD. EQUAT. BY FACTORING'	.104	.192	-.088	NN
40.'ADD. & SUB. OF RATIONAL EXPRE.'	.042	.269	-.227	CC
41.'VOL. OF CUBES, CYLINDERS, RECTAN.'	.146	.308	-.162	NN
42.'APPLIC., SIMPLE TRIANGLES'	.229	.462	-.233	PP
43.'FINDING DISTANCES ON NUMBER LINE'	.042	.077	-.035	CP
44.'ONE UNKNOWN WITH LIT. COEFFI.'	.062	.115	-.053	CC
45.'COMPUTATION OF PROPORTIONS'	.021	.038	-.017	CP
46.'CIRCUMFERENCE & AREA OF CIRCLE'	.021	.038	-.017	PP
47.'SOLVING QUAD. EQUAT. BY FACTORING'	.104	.346	-.242	NN
48.'ONE UNKNOWN WITH NUM. COEFFI.	.021	.308	-.287	CC
49,'ONE UNKNOWN WITH NUM. COEFFI.	.062	.385	-.323	CC
50.'SOLV. QUAD. EQUA. BY QUADRATIC'	.021	.154	-.133	NN